

Applicants assert that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully Submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Specification

At page 5, line 28, the following paragraph was deleted

"FIG. 9 shows a flow chart of the method of increasing the data capacity of optical transmission according to an embodiment of the present invention."

On page 6, lines 8-9, in the first sentence the following was deleted:

Optical carrier generator 110 generates **[(in Step 300 of FIG. 9)]** an optical carrier signal having two side frequencies as described below.

On page 6, beginning with line 35, the following changes were made:

At splitter S2, the output carrier signal 112 is split into two branches 114, 116. Each branch is further split in sub-branches at splitters S3 and S4. The sub-branches output from splitter S3 are input to an upper data modulator 140 and the sub-branches output from splitter S4 are input to a lower data modulator 145. Each data modulator 140, 145 modulates or imprints data onto the optical carrier signal **[(Step 310 of FIG. 9)]**. A first sub-branch signal from S3 is input to Mach-Zehnder interferometer MZ1 of data modulator 140, which also receives an input data signal from a modulator driver MD1 that in turn receives a 10 Gbp/s data signal from digital signal generator DS1. The modulator driver MD1 may be implemented as an oscillator, for example. The interferometer MZ1 acts as an amplitude modulator and imprints the input data signal onto the spectrum of the optical carrier signal. The second sub-branch signal from S3 is input to an optical shifter OS2 which shifts the carrier signal 90 degrees in phase. The output from OS2 is transmitted to an interferometer MZ2, where a similar data modulation takes place (using a 10Gbp/s data signal from data signal generator DS2). Due to the phase shifting of the second sub-branch by OS2, the two data modulations at MZ1 and MZ2 are performed on carrier signals that are 90 degrees out of phase with respect to each other, and therefore in quadrature. When the output from MZ1 and MZ2 are combined in CMB2, the two data-modulated carriers do not interfere because of

their orthogonal phase relationship. Therefore, two data signals from DS1 and DS2 are able to occupy the same spectral region, doubling data capacity to 20 Gbp/s. This spectrum of the output from CMB2 is shown in FIG. 2b. The shaded regions represent areas of the spectrum carrying data, denoted as data bands. The regions extend an octave of 20 GHz, centered on $f_{SR1-A} \pm 30$ GHz with respect to f_{SR1-A} .

Page 8-9, beginning with line 19, the following changes were made:

CMB5, which receives the output of data modulator 145 in block A transmits an output signal to combiner CMB14. The output of CMB9 of block B is input to a polarization transformer PT1, before being combined with the output of CMB5 at CMB14. The functionality of the combiner CMB14 and the polarization transformer PT1 can also be implemented in a single polarization combiner component. The polarization transformer PT1 rotates the polarization of the input signal 90 degrees, from x-polarization to y-polarization, thereby encoding the input with a y-polarization [(Step 320 of FIG. 9)]. The output of combiner CMB4 at the upper branch of block A is passed on to a combiner CMB11 which also receives input from another transmitter block which is not shown. Blocks A and B may be replicated in a series of adjacent transmission channels above and below transmitter 100 in a dense wavelength division multiplexing scheme. In this scheme, combiner CMB11 would receive an output from a polarization transformer in a transmitter block above Block A corresponding to the output from polarization transformer PT2 shown in the lower portion of block B described as follows. The output of combiner CMB10 in block B is passed to the polarization transformer PT2, where the polarization of the output signal is transformed to y-polarization and then transmitted to combiner CMB12, which receives input from a combiner corresponding to combiner CMB4 of Block A output from a further transmitter block below Block B, not shown.